

# Strategies to reduce medication errors

SARAH N. HILMER BSc Med(Hons), MB BS(Hons), FRACP, PhD

Medication errors are common throughout the medication management process and may result in serious adverse drug reactions, particularly in older patients with polypharmacy. Constant vigilance and review, and improved communication with other healthcare practitioners and with patients may reduce errors.

## KEY POINTS

- Medication errors are very common throughout the medication use process; a small proportion of errors cause clinically significant adverse drug events.
- Most medication errors occur in older people exposed to polypharmacy, who are very susceptible to adverse drug events. GPs can significantly reduce medication errors by regular medication review, and rationalising and simplifying medication regimens.
- Communication between healthcare practitioners and between healthcare practitioners and patients is critical to reduce medication errors.
- Medication reconciliation (i.e. verifying the patient's medication history, checking that the medicines are appropriate for the patient and reconciling any discrepancies) is particularly useful at high-risk times such as transitions between the acute sector and the community, or on admission to a residential aged care facility.
- Innovations in electronic medication management at all stages of the medication use process can reduce some errors but may introduce others.



In Australia, there are more than 400,000 GP visits annually to address medication errors.<sup>1,2</sup> About 5 to 11% of medication orders contain an error and 2.5% contain an error that could harm a patient.<sup>3</sup> Nationally, 2 to 3% of hospital admissions are medication related, with an estimated cost of A\$1.2 billion per year, and half of these admissions are potentially avoidable.<sup>1,3</sup>

## What is a medication error?

Medication errors can occur anywhere in the medication use process. Only a small proportion of medication errors cause harm to patients. Most medication errors result in administration of the wrong therapy to the patient without harm or in 'near misses', where the error is noticed and managed before the patient receives the wrong therapy. Errors can be acts of:

- commission, where something is done that should not be done, or
- omission, where something that should be done is not done.

Medication errors may be classified by the stage in the medication use process in which they occur: prescribing, dispensing, administration, monitoring or documentation.<sup>4</sup> The stages most relevant to general practice are prescribing, monitoring and documentation. Prescribing errors are those initiated during the prescribing process and include inappropriate selection of

MedicineToday 2016; 17(7): 44-50

Professor Hilmer is Head of the Department of Clinical Pharmacology and Senior Staff Specialist in Aged Care, Royal North Shore Hospital, Sydney; and Professor of Geriatric Pharmacology at Sydney Medical School at The University of Sydney, Sydney, NSW.



a medication, dose, form or route, and inappropriate or inadequate instructions on the use of the medicine. Monitoring errors include failure to order or act on appropriate clinical or laboratory assessments of therapy. Documentation errors include absent or incorrect information about the medication use in the patient's medical records and/or referral letters.

### **Which patients are most likely to experience medication errors?**

Not surprisingly, the people who experience the most medication errors are those who take the most medicines: that is, older women with polypharmacy. Additional patient risk factors for medication errors include multimorbidity, a diagnosis of dementia, functional impairment, use of alcohol and poor adherence. System risk factors for medication errors include multiple prescribers and recent hospitalisation. In fact, those people most likely to experience medication errors are also those most susceptible to adverse effects from the errors because of their reduced resilience.

### **Which medications most commonly cause errors and adverse events in the community?**

The frequency of medication errors is very closely associated with the frequency of drug utilisation. In adults, medication errors and adverse events occur most commonly with the use of cardiovascular drugs, antithrombotic agents, analgesics, antibiotics, oral antidiabetic agents, antidepressants and anti-epileptics. In older adults, use of drugs with anticholinergic and sedative properties most commonly causes adverse drug events, impairing physical and cognitive function, and are considered potentially inappropriate prescribing in many situations.

In children, errors and adverse events are commonly seen with use of inhaled corticosteroids, antibiotics, antihistamines and paracetamol.

## **What causes medication errors in the community?**

### **Communication**

Although medication errors are usually multifactorial, the most common contributor is thought to be inadequate communication between healthcare practitioners (e.g. doctor and pharmacist, GP and specialist or hospital treating team, between GPs), and between healthcare practitioners and patients or carers.<sup>4</sup> Communication problems that commonly cause medication errors are shown in Tables 1 and 2.<sup>5-7</sup> Although all of the strategies that have been employed to address communication issues have been shown to reduce errors, none has consistently been shown to improve clinical outcomes.

### **Environment**

Environmental factors also contribute to medication errors at all stages of the medication management cycle. These include distractions, limited time and fatigue, and these factors can affect healthcare practitioners and patients or carers.

### **Knowledge**

Limitations in knowledge or understanding about medicines may also increase the risk of medication errors. Patients need to understand what medicines they take, why they take them, how to take them, what therapeutic and side effects to look for, what strategies to adopt when side effects or therapeutic failure occurs, and how long to take the medicine for (see communication between healthcare practitioners and patients in Table 1).

For healthcare providers, knowledge gaps may include the following.

- Knowledge of the patient's total medicines exposure, including nonprescribed medicines (over-the-counter or complementary). This is particularly important to avoid drug–drug interactions and therapeutic duplication by multiple prescribers, including nonmedical prescribers. Maintaining an up-to-date medication list and communicating it to the patient's other healthcare providers is an important strategy to minimise this cause of errors in primary care. Pharmacists, particularly accredited pharmacists performing home medication reviews, can help assemble an accurate medication list for patients with complex conditions. Medication reconciliation techniques (see below) also help practitioners maintain an accurate medication list for their patients.
- Knowledge of all the patient's diagnoses. This is essential to avoid drug–disease interactions, which are extremely common in older adults with multimorbidity. It has been estimated that one in five older adults take a medicine that may adversely affect a coexisting condition.<sup>8</sup> Maintaining an accurate list of the patient's diagnoses can help address this cause of errors, and the MBS Health Assessments may

**TABLE 1. STRATEGIES TO ADDRESS COMMON COMMUNICATION ISSUES THAT CONTRIBUTE TO MEDICATION ERRORS**

Communication issue	Strategy
<i>Between prescriber and pharmacist</i>	
Illegible handwritten prescription	<ul style="list-style-type: none"> <li>• Print prescription as neatly as possible</li> <li>• Double check if unsure about legibility</li> <li>• Electronic prescribing/type out prescription</li> </ul>
Confusion about abbreviations	<ul style="list-style-type: none"> <li>• Use only approved abbreviations<sup>5</sup></li> </ul>
Confusion between drug names that look or sound alike	<ul style="list-style-type: none"> <li>• Read alerts about these drugs</li> <li>• Use tall man lettering to distinguish the differences (Table 2)</li> </ul>
<i>Between community and acute settings</i>	
Communication across transitions of care	<ul style="list-style-type: none"> <li>• Medication reconciliation (often multidisciplinary)</li> </ul>
<i>Between healthcare practitioners and patients</i>	
Better patient/carer education required	<ul style="list-style-type: none"> <li>• Explain and provide an updated patient medication list</li> <li>• Provide consumer medicines information appropriate for patient’s health literacy and language, e.g. NPS MedicineWise consumer portal and medicines telephone line</li> <li>• Pharmacist and nurse disease management educational interventions can reduce errors in specific chronic diseases</li> </ul>

provide an opportunity to do this in primary care.

- Knowledge of the clinical pharmacology of the patient’s medicines. The complexity and breadth of general practice mean that primary healthcare practitioners cannot possibly know the indications, contraindications, modes of action, side effects, interactions, dosing and monitoring requirements for all of their patients’ medicines. There are several national medicines information resources that can assist and these include the *Australian Medicines Handbook*, the registered product information available on the TGA website and published in MIMS, Therapeutic Guidelines and many resources freely available through NPS MedicineWise. Point of care computerised clinical decision

support is available through prescribing software, although the benefits of its use must be balanced against the risk of alert fatigue.<sup>3</sup>

**Interventions to reduce medication errors in the community**

**Medication reconciliation**

Medication reconciliation involves verifying the patient’s medication history, checking that the medicines are appropriate for the patient and reconciling any discrepancies. Although this process reduces medication errors, it has not been shown to significantly impact on patient morbidity or mortality.<sup>9</sup> In Australia, medication reconciliation is now a major component of hospital quality and safety standards. However, errors at transitions of care remain highly prevalent. GPs need to be aware that medication errors may

occur in hospital discharge summaries and there is a role for reconciliation by the GP after discharge. Pharmacists or practice nurses may be able to assist with this process.

**Healthcare professional education**

Healthcare professionals need better training in clinical pharmacology and therapeutics, as well as safety principles, to prescribe safely and effectively. A recent study of medical graduates in NSW teaching hospitals during intern orientation week found that none of them could prescribe discharge medications accurately for a hypothetical patient and that almost all thought that they needed more training in clinical pharmacology.<sup>10</sup> Innovative models of interprofessional learning in clinical pharmacology, therapeutics and medication safety, for medical, pharmacy and nursing students may reduce errors.

In the UK, medical graduates are now required to pass a national prescribing competency test before practising in public hospitals, although the impact of this testing on prescribing and clinical outcomes has not yet been established.<sup>11</sup> In Australia, the online NPS MedicineWise prescribing curriculum and medication safety module supports students and practitioners.

There is limited postgraduate training in medication safety outside of academic institutions. NPS MedicineWise provides practitioner education in the quality use of medicines through written information, continuing professional development programs and tools for auditing your own practice.

**Patient education and adherence aids**

Ensuring that the patient has a good understanding of their medicines has a major impact on medication safety and adherence. Patients require support to maintain their own accurate, updated medication list. Written consumer medicines information consistent with the patient’s health

literacy and language requirements is useful. Programs run by pharmacists and nurses that educate patients on medicines and self-management of a single disease, e.g. heart failure,<sup>12</sup> can improve adherence and clinical outcomes.

Direct inquiries and requests for repeat prescriptions more or less often than expected can alert practitioners to problems with adherence. Dose administration aids such as dosette boxes and blister packs can help patients adhere to their medicines and reduce errors in administration. Some patients will require support to administer their medicines. Those referred to community nursing for assistance with medication administration are usually older people with polypharmacy, and the prevalences of errors and adverse drug events remain high even with support.<sup>13</sup>

**e-Health interventions**

Electronic systems have been implemented to support prescribing (by eliminating legibility and abbreviation issues and providing decision support), dispensing (barcoding) and administration (barcoding and medication reminders). These systems reduce some errors, introduce others, and require significant financial and training resources. The current e-health initiatives within and between community practice, hospital practice and residential aged care facilities are fragmented and are unlikely to overcome the challenges of communication between different sites and between different practitioners providing care for a patient.

**Medication reviews**

Medication reviews can be performed by a doctor and/or pharmacist. Ideally, medication reviews should be part of every consultation. For high-risk patients, both Home Medicine Reviews (HMR) and Residential Medication Management Reviews (RMMR) use a team approach, involving dialogue between the patient, their GP and an accredited pharmacist, to identify and address any medication

**TABLE 2. EXAMPLES OF DRUG NAMES THAT LOOK OR SOUND ALIKE, CAUSING CONFUSION AND ERROR<sup>6,7\*</sup>**

Drug name	Confused drug name
aMILoride	amLODIPine
AldOMET (methyldopa)	AldACTONE 25 mg (spironolactone)
LaMICtal (lamotrigine)	LamISIL (terbinafine)
LasIX (furosemide)	LosEC (omeprazole)
oxyCODONE	OxyCONTIN
OxyCONTIN	MS Contin
penicILLAMINE	penicillin
Proton pump inhibitors	ARIPiprazole (atypical antipsychotic)
quinIDine (available on special access scheme)	quinINE
Zantac (ranitidine)	ZyrTEC (cetirizine), Xanax (alprazolam; not available in Australia but patients may be familiar with the brand name)

\* Similarities may occur with generic and trade names of prescribed and over-the-counter drugs. Drug names are presented using tall man lettering to draw attention to their differences, which is a strategy recommended for reducing medication errors. Extra caution is also required for drugs where the extended-release formulation has the same trade name with an XR on the end or combination formulations that use the same trade name with a plus added to it.

errors, which is consistent with the ‘Swiss cheese’ model of reducing human error.<sup>14</sup> Pharmacist-led medication reviews have been consistently shown to improve medication use, and are most effective when part of a multidisciplinary intervention, but have not been consistently shown to improve clinical outcomes.<sup>9,14</sup>

**Reducing medication errors in residential aged care facilities**

People who live in residential aged care facilities, who are generally frail, older people with multimorbidity and polypharmacy, are at the highest risk of medication errors and adverse drug events. People living in residential aged care facilities each take an average of eight medicines per day. On a spot audit of prescribing, monitoring, dispensing and administration over two drug rounds in 55 UK care homes, 70% of residents experienced a medication error, with an average of two errors per resident.<sup>15</sup> Strategies for minimising the risk of medication

errors in this vulnerable population are outlined in Table 3.<sup>15-17</sup> Although there are many complex systems issues, the GP can make a major impact on medication error by rationalising the regimen to those medicines that are essential for the resident to achieve their care goals (see *Medicine Today* June 2016).<sup>18</sup>

**Managing medication errors**

Like other errors in health care, disclosure of medication errors is important for the care of and relationship with the patient involved, and for understanding the causes of the error to reduce the risk of further errors.

Although there are well-established systems to report, monitor and address medication errors in institutions, these are not currently embedded in primary care. In the community, errors may occur when patients or their carers administer drugs and these need to be discussed with the patient and managed with strategies such as patient education, medication lists, dose administration aids and

**TABLE 3. STRATEGIES TO REDUCE MEDICATION ERRORS IN RESIDENTIAL AGED CARE FACILITIES<sup>15-17</sup>**

Type of error	Approximate prevalence	Strategies
Prescribing, documentation and monitoring errors	Among people living in RACFs: prescribing errors occur in 40%, potentially inappropriate medicines are prescribed to 20% and monitoring errors occur in 10%	<ul style="list-style-type: none"> <li>• Deprescribe medicines that do not help the patient achieve their goals</li> <li>• Simplify regimens where possible by using long-acting formulations and adjusting administration times</li> <li>• Improve accuracy and communication about patient information (e.g. medication reconciliation at transitions of care); potential for shared electronic health records between RACF and general practice</li> <li>• Educate all healthcare professionals and consumers to identify and act on errors</li> <li>• Use clinical risk assessment tools at point of care through medicines information resources (e.g. AMH Aged Care Companion, RACGP Silver Book) or through computerised clinical decision support in electronic prescribing</li> <li>• Residential Medication Management Review by an accredited pharmacist</li> </ul>
Dispensing error	Errors in dispensing occur in 5 to 10% of blister packs	<ul style="list-style-type: none"> <li>• Simplify medication regimens</li> <li>• Improve accuracy of communication of medication orders to pharmacist</li> <li>• Improve pharmacy systems, guidance and checking for pharmacists packing dose administration aids</li> </ul>
Administration error	Of older people in RACFs, 20% experience a medication administration error each day	<ul style="list-style-type: none"> <li>• Simplify medication regimens</li> <li>• Improve accuracy and legibility of medicine administration records</li> <li>• Provide time for and reduce interruptions on administration rounds</li> <li>• Educate nurses on resident medication regimens, appropriate medicine administration techniques and recognition of medications provided in dose administration aids</li> </ul>

Abbreviation: RACFs = residential aged care facilities.

supervised medication management. Practitioners can report error-prone issues related to drug names, labelling or medicines information to the TGA. Reports to medical indemnity providers or healthcare complaints may result in individual practitioner remediation but do not systematically address patterns of errors.

### Conclusion

GPs can work with other healthcare practitioners and patients to reduce medication errors and preventable adverse drug events. Older people with multimorbidity and polypharmacy are at highest risk of medication errors and most vulnerable to adverse events from them. Improved communication across

our fragmented healthcare system can be facilitated with interventions such as multidisciplinary medication reconciliation. Electronic medication management solutions, particularly those with computerised clinical decision support, reduce some types of error but introduce others, and have not yet been able to bring information from a patient's different care settings and providers together. On a practitioner level, constant vigilance is required to minimise the risk of iatrogenic harm. **MT**

### References

A list of references is included in the website version of this article ([www.medicinetoday.com.au](http://www.medicinetoday.com.au)).

COMPETING INTERESTS: None.

### ONLINE CPD JOURNAL PROGRAM

What proportion of medication orders contain a potentially harmful error?



Review your knowledge of this topic and earn CPD points by taking part in **MedicineToday's** Online CPD Journal Program. **Log in to** [www.medicinetoday.com.au/cpd](http://www.medicinetoday.com.au/cpd)

# Strategies to reduce medication errors

SARAH N. HILMER BSc Med(Hons), MB BS(Hons), FRACP, PhD

## References

1. Runciman WB, Roughead EE, Semple SJ, Adams RJ. Adverse drug events and medication errors in Australia. *Int J Qual Health Care* 2003; 15 Suppl 1: i49-i59.
2. Australian Commission on Safety and Quality in Health Care (ACSQHC). Second national report on patient safety: improving medication safety. Sydney: ACSQHC; 2002. Available online at: <http://www.safetyandquality.gov.au/wp-content/uploads/2012/12/Second-National-Report-on-Patient-Safety-Improving-Medication-Safety.pdf> (accessed June 2016).
3. Australian Commission on Safety and Quality in Health Care (ACSQHC). Literature review: medication safety in Australia. Sydney: ACSQHC; 2013. Available online at: <http://www.safetyandquality.gov.au/wp-content/uploads/2014/02/Literature-Review-Medication-Safety-in-Australia-2013.pdf> (accessed June 2016).
4. Easton K, Morgan T, Williamson M. Medication safety in the community: a review of the literature. Sydney: National Prescribing Service; 2009. Available online at: [http://www.nps.org.au/\\_\\_data/assets/pdf\\_file/0008/71675/09060902\\_Meds\\_safety\\_June\\_2009.pdf](http://www.nps.org.au/__data/assets/pdf_file/0008/71675/09060902_Meds_safety_June_2009.pdf) (accessed June 2016).
5. Australian Commission on Safety and Quality in Health Care (ACSQHC). Recommendations for terminology, abbreviations and symbols used in the prescribing and administration of medicines. Sydney: ACSQHC; 2011. Available online at: <http://www.safetyandquality.gov.au/wp-content/uploads/2012/01/32060v2.pdf> (accessed June 2016).
6. Institute for Safe Medication Practices (ISMP). ISMP's list of confused drug names. Horsham, PA: ISMP; 2015. Available online at: <https://www.ismp.org/tools/confuseddrugnames.pdf> (accessed June 2016).
7. Therapeutic Goods Administration (TGA). TGA medicine labelling and packaging review. Canberra: TGA; 2012. Available online at: <https://www.tga.gov.au/book/look-alike-and-sound-alike-medicine-brand-names-and-look-alike-packaging-and-branding> (accessed June 2016).
8. Lorgunpai SJ, Grammas M, Lee DS, McAvay G, Charpentier P, Tinetti ME. Potential therapeutic competition in community-living older adults in the U.S.: use of medications that may adversely affect a coexisting condition. *PloS One* 2014; 9(2): e89447.
9. Lehnbohm EC, Stewart MJ, Manias E, Westbrook JL. Impact of medication reconciliation and review on clinical outcomes. *Ann Pharmacother* 2014; 48: 1298-1312.
10. Hilmer SN, Seale JP, Le Couteur DG, Crampton R, Liddle C. Do medical courses adequately prepare interns for safe and effective prescribing in New South Wales public hospitals? *Intern Med J* 2009; 39: 428-434.
11. Maxwell SR, Cameron IT, Webb DJ. Prescribing safety: ensuring that new graduates are prepared. *Lancet* 2015; 385: 579-581.
12. Milfred-LaForest SK, Chow SL, DiDomenico RJ, et al. Clinical pharmacy services in heart failure: an opinion paper from the Heart Failure Society of America and American College of Clinical Pharmacy Cardiology Practice and Research Network. *Pharmacotherapy* 2013; 33: 529-548.
13. Elliott RA, Lee CY, Beanland C, Vakil K, Goeman D. Medicines management, medication errors and adverse medication events in older people referred to a community nursing service: a retrospective observational Study. *Drugs Real World Outcomes* 2016; 3: 13-24.
14. Chen TF. Pharmacist-led home medicines review and residential medication management review: the Australian model. *Drugs Aging* 2016; 33: 199-204.
15. Barber ND, Aldred DP, Raynor DK, et al. Care homes' use of medicines study: prevalence, causes and potential harm of medication errors in care homes for older people. *Qual Saf Health Care* 2009; 18: 341-346.
16. Gilmartin JF, Marriott JL, Hussain SY. Exploring factors that contribute to dose administration aid incidents and identifying quality improvement strategies: the views of pharmacy and nursing staff. *Int J Pharm Pract* 2014; 22: 407-414.
17. Wilson NM, March LM, Sambrook PN, Hilmer SN. Medication safety in residential aged-care facilities: a perspective. *Ther Adv Drug Saf* 2010; 1: 11-20.
18. LeCouteur DG, McLachlan AJ, Hilmer SN. Polypharmacy in older people: when should you deprescribe? *Medicine Today* 2016; 17 (6): 16-24.